Having thus described the invention, what we claim is:

1. A method for the partial oxidation of hydrocarbons to produce hydrogen and carbon monoxide whereby initiation of said partial oxidation is at a temperature as low as about 10°C or higher by contacting a reduced metal catalyst consisting essentially of a transition metal selected from the group consisting of nickel, cobalt, iron, platinum, palladium, iridium, rhenium, ruthenium, rhodium, osmium and combinations thereof supported on or in a ceria-coated zirconia monolith support with a mixture of a hydrocarbon-containing feed gas and an oxygen-containing feed gas and hydrogen.

2. The method as claimed in claim 1 wherein said hydrogen is injected into said feed gas mixture.

3. The method as claimed in claim 2 wherein said hydrogen is injected between the addition of said hydrocarbon-containing feed gas and said oxygen-containing feed gas.

4. The method as claimed in claim 1 wherein said temperature is greater than 10°C and less than 100°C.

5. The method as claimed in claim 1 wherein said ceria-coated zirconia monolith support is about 5% to about 30% ceria by weight.

6. The method as claimed in claim 2 wherein the injection flow of said hydrogen is for about 10 to about 30 seconds.

7. The method as claimed in claim 1 wherein said hydrogen is obtained from the product hydrogen.

8. The method as claimed in claim 1 wherein said feed gas is at a pressure of between 1 and 20 atmospheres.

9. The method as claimed in claim 1 wherein said feed gas has a standard gas hourly space velocity of about 50,000 to about 500,000 per hour.

10. The method as claimed in claim 1 wherein said feed gas has a linear velocity of about 0.2 to about 2.0 meters per second.

11. The method as claimed in claim 5 wherein said hydrogen is present in an amount of about 0.5 to about 4.0 percent by volume of the total flow of said feed gas.

12. A method for the partial oxidation of hydrocarbons to produce hydrogen and carbon monoxide whereby initiation of said partial oxidation is at a temperature as low as about 10°C by contacting a reduced metal catalyst consisting essentially of a transition metal selected from the group consisting of nickel, cobalt, iron, platinum, palladium, iridium, rhenium, ruthenium, rhodium, osmium and combinations thereof supported on or in a ceria-coated zirconia monolith support with a mixture of a hydrocarbon-containing feed gas and an oxygen-containing feed gas and a continuous feed of hydrogen.

13. The method as claimed in claim 12 further comprising adding a continuous flow of carbon dioxide to said feed gas.

14. The method as claimed in claim 12 wherein said hydrogen is injected into said feed gas mixture.

15. The method as claimed in claim 12 wherein said temperature is greater than 10°C and less than 100°C.

16. The method as claimed in claim 12 wherein said ceria-coated zirconia monolith support is about 5% to about 30% ceria by weight.

17. The method as claimed in claim 12 wherein said hydrogen is obtained from the product hydrogen.

18. The method as claimed in claim 12 wherein said feed gas is at a pressure of between 1 and 20 atmospheres.

19. The method as claimed in claim 12 wherein said feed gas has a standard gas hourly space velocity of about 50,000 to about 500,000 per hour.

20. The method as claimed in claim 12 wherein said feed gas has a linear velocity of about 0.2 to about 2.0 meters per second.

21. The method as claimed in claim 14 wherein said hydrogen is present in an amount of about 0.5 to about 4.0 percent by volume of the total flow of said feed gas.

22. A method for the partial oxidation of hydrocarbons to produce hydrogen and carbon monoxide by contacting a rhodium catalyst supported on or in a ceria-coated zirconia monolith support with a mixture of a hydrocarbon-containing feed gas and an oxygen-containing feed gas and carbon dioxide.

23. The method as claimed in claim 22 wherein said carbon dioxide is present in said feed gas mixture in amounts up to about 80% by volume.

24. The method as claimed in claim 22 wherein said feed gas is at a pressure of between 1 and 20 atmospheres.

25. The method as claimed in claim 22 wherein said feed gas has a standard gas hourly space velocity of about 50,000 to about 500,000 per hour.

26. The method as claimed in claim 22 wherein said feed gas has a linear velocity of about 0.2 to about 2.0 meters per second.

27. The method as claimed 22 wherein said ceria-coated zirconia monolith support is about 5% to about 30% ceria by weight.

28. A reactor comprising a vessel, at least one ceramic foam disk impregnated with a catalytic material and at least one blank ceramic foam disk.

29. The reactor as claimed in claim 28 wherein said vessel is refractory lined.

30. The reactor as claimed in claim 28 which is in the shape of a pipe or tube and has a diameter of about 1 to about 100 inches.

31. The reactor as claimed in claim 28 wherein said catalytic material comprises zirconia coated with ceria and containing rhodium or nickel or a mixture of rhodium and nickel.

32. The reactor as claimed in claim 31 wherein ceria coating comprises about 15 to about 20 percent by weight of said ceramic foam monolith material.

33. The reactor as claimed in claim 31 wherein said rhodium or nickel or mixture of nickel and rhodium is about 2 to about 4 weight percent of said ceramic foam monolith

34. The reactor as claimed in claim 28 comprising a plurality of said ceramic foam disk impregnated with a catalytic material and a plurality of blank ceramic foam disks.

35. The reactor as claimed in claim 28 wherein said at least one blank ceramic foam disk is selected from the group consisting of alumina, zirconia, cordierite or mixtures thereof.

36. The reactor as claimed in claim 28 further comprising a quenching system.

37. A method for the partial oxidation of hydrocarbons to produce hydrogen and carbon monoxide by contacting a reduced metal catalyst consisting essentially of a transition metal selected from the group consisting of nickel, cobalt, iron, platinum, palladium, iridium, rhenium, ruthenium, rhodium, osmium and combinations thereof supported on or in a ceria-coated zirconia monolith support with a mixture of a hydrocarbon-containing feed gas and an oxygen-containing feed gas and hydrogen at a pressure of about 1.0 bar to about 10.0 bar.

38. The method as claimed in claim 37 wherein said pressure is about 1.5 bar to about 3.0 bar.

39. The method as claimed in claim 37 where the ratio of hydrogen to carbon monoxide produced by said partial oxidation is about 2:1 hydrogen to carbon monoxide.

40. The method as claimed in claim 37 wherein said ceria-coated zirconia monolith support is about 5% to about 30% ceria by weight.

41. The method as claimed in claim 37 wherein said transition metal is rhodium.